

Comparing the Teaching Efficacy of a Procedure-in-a-Box Toolkit to a Live Instructional Workshop

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Abstract

Background: Emergency procedures have been traditionally taught in live "hands on" workshops, which are expensive (tuition, travel, hotel, and leaving one's practice idle). This study was conducted to compare the teaching efficacy of a traditional live workshop to a procedure-in-a-box toolkit (PBT) method which contains audiovisual instructions and props to practice the procedures.

Methods: Four procedures, zipper release, intraosseous needle placement, fishhook removal, and splinting, were taught to 32 physician volunteers, using both teaching methods. Each participant was asked to evaluate the teaching method after each session.

Results: The mean educational quality of each method were not significantly different from each other, but if given a choice study subjects preferred the live workshop more often.

Conclusion: The live workshop is the preferable method for teaching procedures but when considering expenses, most of the subjects felt that the PBT method is an adequate substitute method for the live workshop.

Introduction

Medical/surgical procedures are traditionally taught in workshops ("hands on" live teaching, demonstrations and practice, under the supervision of teachers with expertise in the procedure). Workshops require teaching assistants, thus they are largely limited to live sessions. Workshops are expensive since their total cost includes the course fee, travel expense, hotel and meal expenses, and time off from one's practice to attend the workshop. Temporarily leaving the practice incurs several costs during this period, which include lack of revenue, idle office lease expense, office staff who must still answer phones, and locum tenens expenses. More convenient and economical educational methods using enduring materials (books) could demonstrate procedures, but the "hands on" experience is absent. An intermediate approach is to provide a box of props to be used in conjunction with a video disc or tape to replicate the live workshop. The video demonstrates the procedure and the props provide the opportunity for the learner/student to practice the procedure. The purpose of this study is to assess the

potential teaching efficacy of this procedure-in-a-box toolkit by comparing it with the instructional quality of a live workshop.

Methods

Four procedures, typically performed in the emergency department, were chosen for this study: zipper release, intraosseous needle placement, fishhook removal, and splinting. Pediatric residents, community pediatricians, and university faculty pediatricians who had not performed or taught these procedures in the past 10 years, volunteered to participate as subjects in this study (convenience sample). Study subjects were taught the procedures using both methods: traditional live "hands on" instruction and the procedure-in-a-box toolkit (PBT) containing a videotape, written instructions, and the necessary props and materials to practice the procedures. After obtaining written informed consent for participation, all subjects were assigned to two groups (by convenience); exposed to the live session method first and then the PBT method later, or in reverse order. The order of exposure was not randomized because of restrictions on scheduling the date of the live workshop. While the PBT method could be performed at home, the live workshop was more efficiently done on the same date and time with most of the study group assembled together. Some had already completed the PBT method, and the remainder completed the PBT method after the live workshop.

The live workshop was held in a classroom with live instructors. Participants could practice the procedure with feedback from the instructors. Participants could freely ask any questions during the session.

For the PBT method, an instructor demonstrated the procedure on a video. Written instructions and props to practice the procedure were provided in the PBT¹⁻⁴. The PBT contained the following props: zipper, diagonal cutting pliers, intraosseous needle, bone model (either the plastic infant leg model with replaceable bone insert or a chicken thigh), medium sized fishhook, pork skin (pig back), large hemostat, fiberglass splint material (prepackaged with padding

on both sides), elastic wrap bandage. They could not ask questions while they were watching the videotape since no instructor was present, but they were allowed to stop or replay the video at any time.

After completing each session, subjects were asked to complete a questionnaire to assess the quality of each teaching method. After completing both sessions, they were asked to compare both methods. This study was approved by the hospital institutional review board.

Results

36 subjects were initially enrolled in this study. 18 subjects (12 residents and four university faculty pediatricians, and two community pediatrician) were exposed to the live workshop first (group 1) and 18 subjects (15 residents and three community pediatricians) were exposed to the PBT method first (group 2). 32 subjects completed the study. 2 subjects in group 1 participated the live session but could not watch the PBT video during the study period and 2 subjects in group 2 could not come to a live workshop session after watching the PBT video.

After each session, study subjects were asked to reply to: "I feel confident that I can perform this procedure without supervision" using the following scale: 4-Strongly agree, 3-Agree, but not strongly agree, 2-Neutral (neither agree nor disagree), 1-Disagree, but not strongly, 0-Strongly disagree. Most subjects agreed with this statement for most of the procedures (231 of 256 responses total). Out of the 256 ratings there were 20 neutral responses (6 for the live workshop and 14 for the PBT method). There were 5 "disagree responses, but not strongly" responses (1 for the live workshop and 4 for the PBT method); however, all 4 of these responses in the PBT method came from the same study subject. Table 1 compares the mean scores for the initial method (the live workshop for group 1 and the PBT method for group 2) in both groups. The mean score following the initial teaching method for the zipper release and the splinting procedures, were significantly higher for the live workshop compared to the PBT. The differences for the other two procedures were not statistically significant, however, the small sample size results in low statistical power. Both methods showed substantial improvements above the subjects' baseline ability to perform these procedures (prior to any of the sessions) indicating that substantial learning took place with both teaching methods.

After each session, study subjects were asked to rate the session's educational quality using the following scale: 4-Very good, excellent, 3-Good, 2-Fair, 1-Borderline/Marginal, 0-Poor.

Table 2 tabulates the mean scores for each procedure for each teaching method. The scores were not statistically significant between the two teaching methods.

After completing both methods, subjects were asked, "Which teaching method were you most comfortable

with in learning this procedure?" For the zipper release, IO, fishhook removal and splinting procedures, respectively, 47%, 56%, 31% and 38% preferred the live workshop, while 25%, 9%, 13%, and 13% preferred the PBT, and 28%, 34%, 56%, and 50% felt that they were both about the same.

After both sessions (live workshop and PBT) were completed, study subjects were asked, "Do you think that for some skills, the Procedure-in-a-Box Toolkit is an adequate substitute for a live CME workshops?" In answering, they were also asked to consider expense and convenience factors related to the practice (or for their anticipated practice after residency completion). Out of 32 subjects, 5 replied that the PBT can be better than a live CME workshop, 12 replied that the PBT can be as good as a live CME workshop, and 15 replied that the PTB can be a satisfactory substitute, but it is not as good as a live CME workshop. None indicated that the PBT is an inadequate substitute for a CME workshop.

Discussion & Conclusions

Continuing medical education (CME) courses often include procedure workshops. The delivery of many CME programs is a business which involves marketing. Most physicians have access to inexpensive CME such as reading journals and attending local conferences. However, many physicians travel to attend large CME programs. There are often supplementary benefits from attending these conferences, such as the social aspects of meeting with colleagues, participation in organized medicine, proximity to recreational/tourist areas, etc. Large CME programs are generally expensive (tuition, travel/hotel, and leaving one's practice idle). For most aspects of a CME program, watching a video reproduction of the event is sufficient. The opportunity to directly interact with the speaker is lacking, but most attendees are only listeners anyway. While the CME program might charge a large fee for a video reproduction of the CME event, the travel/hotel/practice expenses are avoided.

Workshops are more difficult to deliver via video alone. Workshops are generally conducted in smaller groups (higher faculty to student ratios) with a focus of "hands on" learning, supplemented by props, medical devices, learning aids, models, manikins, etc. The "hands on" aspect can be delivered as a toolkit containing the necessary props to learn the procedure.

The lack of statistical significance in the self-rated competence scores for three of the four procedures could be due to an inadequate sample size (table 1). It is likely that in reality, the live workshop method is intuitively superior because of the opportunity to interact directly with an experienced instructor, which should improve the confidence level (to perform the procedure successfully) of the learners. However, the educational quality scores were not significantly dif-

ferent between the two methods. When considering the expense of the live workshop, the PBT method is a satisfactory substitute.

With imagination, a PBT substitute for most (but not all) procedures and workshop topics can be created. Expensive patient simulators for procedures such as thoracotomy and central line placement could be loaned as part of a PBT. However, loaning expensive simulators to individuals would be an inefficient use of such an expensive resource.

Morgan, et al, compared the efficacy of learning critical case scenarios between video-assisted and simulator-assisted methods and found that there are no statistical difference in these two learning methods⁵ but we could find no study comparing the teaching efficacy of a live CME workshop for practicing physicians with an audiovisual-based method.

McLeod, et al, developed a cognitive theory based checklist of seven important principles for teaching procedural and technical skills such as demonstrating the procedure in order to allow participants for questions and interruptions and observing the learners in action⁶. These principles are only fulfilled by the live "hands on" sessions. But the main barrier to obtain training for emergency procedures is the lack of faculty who are competent in specific procedural skills in the majority of educational programs⁷ and additional barriers are space and access to equipment⁸. The PBT method overcomes these latter barriers. Teleconferencing overcomes some of these barriers, potentially teaching procedure sessions to many people at same time at multiple sites. A high faculty to student ratio is still required for the instructors to observe learners' procedural skills. The observation of the student performing the procedure to receive evaluation feedback from an instructor is still lacking in the PBT method. This is probably not necessary for simple procedures, such as those in this study, but for more complex procedures, direct supervision is required, and thus, the PBT method would not be an acceptable substitute.

In conclusion, live workshops are preferable, however, when considering travel and practice costs, the procedure-in-a-box toolkit method can be a satisfactory method of teaching some procedures.

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Table 1.— I feel confident that I can perform this procedure without supervision. Mean scores \pm standard deviation (see rating scale below)

	Zipper release	IO	Fishhook removal	Splinting
Group 1 (live method first) (n=16)				
Mean live method score	3.7 \pm 0.5	3.3 \pm 0.9	3.8 \pm 0.6	3.8 \pm 0.4
Group 2 (PBT method first) (n=16)				
Mean PBT score	3.1 \pm 1.0	3.0 \pm 0.8	3.6 \pm 0.7	3.4 \pm 0.6
P values (T-test)	p=0.06	NS	NS	p=0.02
Score prior to the session (n=32)				
	0.6 \pm 0.9	1.9 \pm 0.9	1.2 \pm 1.2	1.7 \pm 1.1

Rating scale: 4-Strongly agree, 3-Agree, but not strongly agree, 2-Neutral (neither agree nor disagree), 1-Disagree, but not strongly, 0-Strongly disagree

This table describes the confidence level after the initial teaching method only.

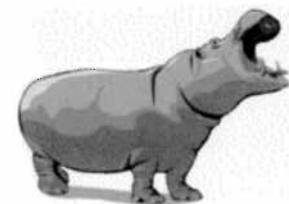
Table 2.— Educational quality of sessions. Mean scores \pm standard deviation (see rating scale below)

	Zipper release	IO	Fishhook removal	Splinting
Mean live workshop score (n=32)	3.4 \pm 0.7	3.5 \pm 0.7	3.5 \pm 0.7	3.5 \pm 0.7
Mean PBT score (n=32)	3.4 \pm 0.6	3.4 \pm 0.6	3.5 \pm 0.6	3.4 \pm 0.6
P values (paired T-test)	NS	NS	NS	NS

Rating scale: 4-Very good, excellent, 3-Good, 2-Fair, 1-Borderline/Marginal, 0-Poor

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